

Static Electricity ⚡

A Model for Charged 🔬 Particles

 Mr. Porter

 2023 - Physics

Van de Graff Generator

Explain:

- Why do you get "shocked"
- Why does the hair stand up?



A close-up photograph of a kitchen faucet with a black aerator. A thin stream of water is flowing from the faucet. A green plant stem is held vertically under the water stream by a hand. The water stream is deflected to the left, following the curve of the plant stem. The background is blurred, showing a window and a wooden surface.


Why does the water bend?

Sticky Tape Lab

- When Tape is pulled apart the individual pieces of tape become *charged*.

Sticky Tape Lab

- When Tape is pulled apart the individual pieces of tape become *charged*.

 How do these charged pieces of tape interact with each other?

Charge

- All objects have charge
- Charge is based on number of protons (+) or electrons (−)
- Charge is negative or positive

Elementary Charge

- A fundamental property of matter
- Charge is quantized → Comes in specific amounts
- An elementary charge is the smallest sized charge (like a penny in USD)
- Charge can be measured in:
 - Elementary Charges (e) (small amounts)
 - Coulombs (C)

+ Protons: $1e = 1.6 \times 10^{-19}$ Coulombs

— Electrons: $-1e = -1.6 \times 10^{-19}$ Coulombs

? Check Your Understanding

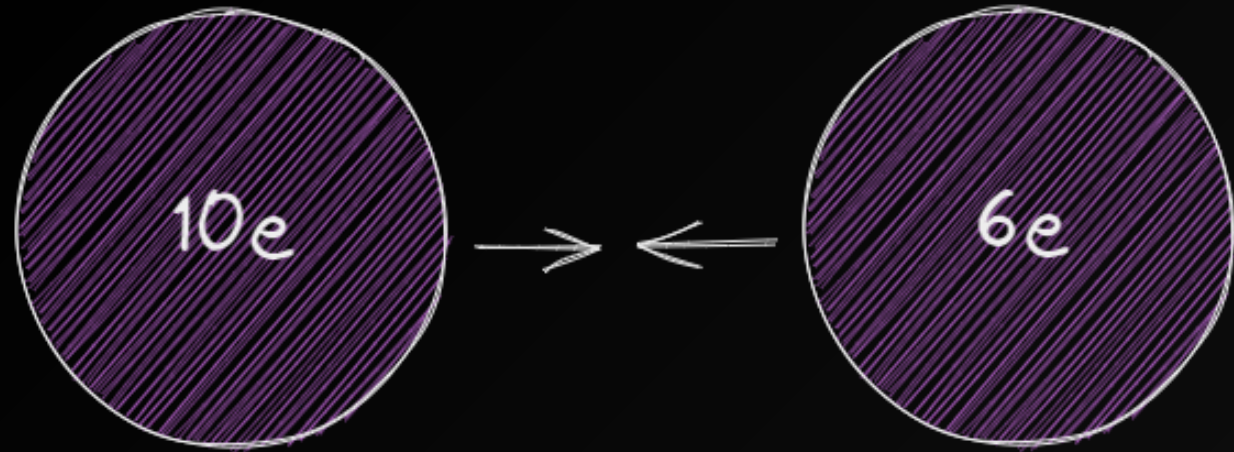
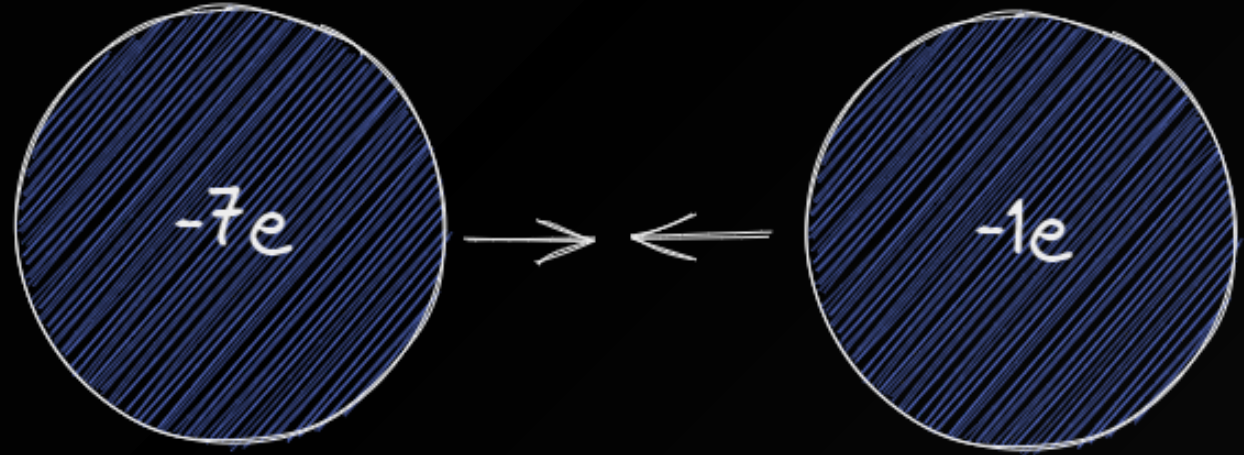
How many extra electrons does an object with a charge of -9.6×10^{-19} C have?

Conservation of Charge

The total charge in a system is constant

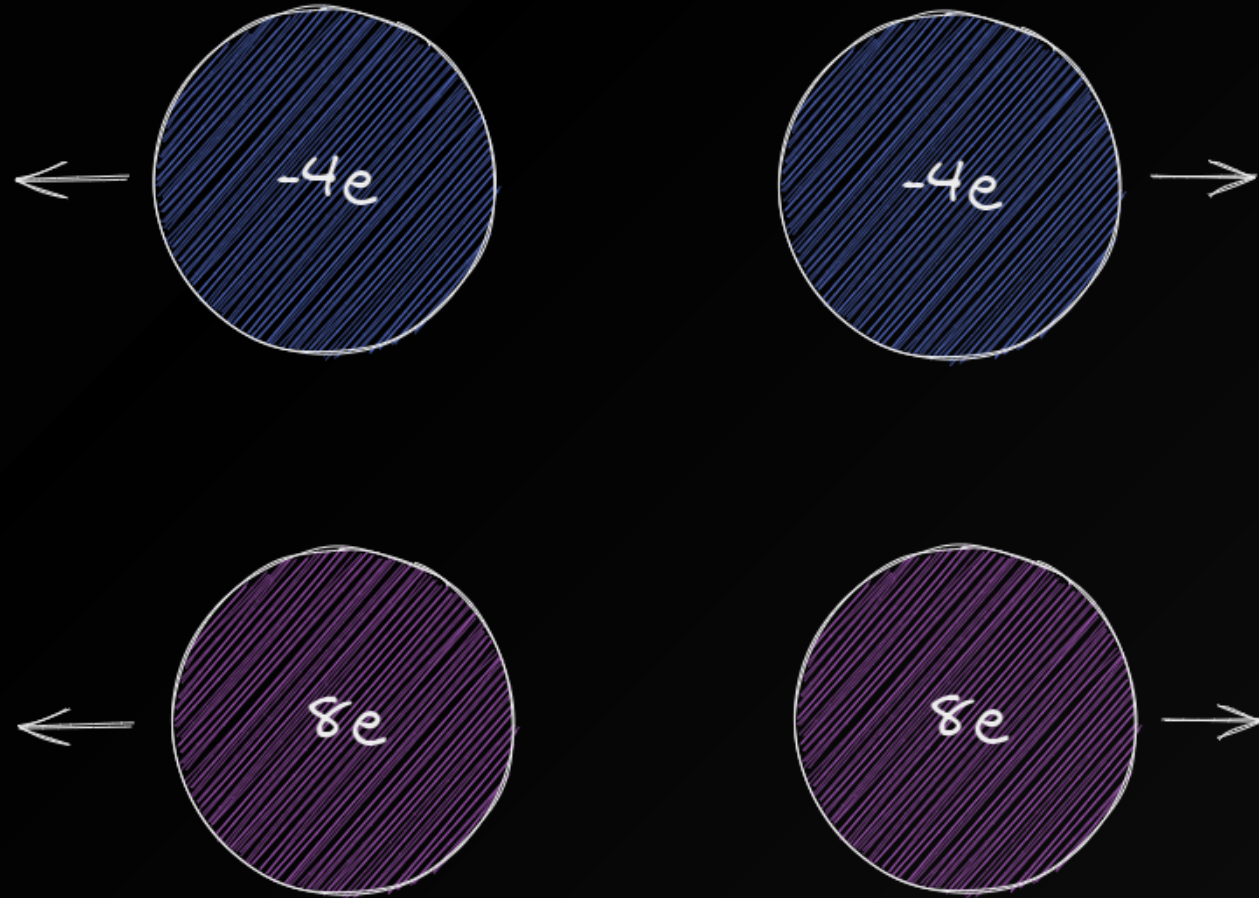
Conservation of Charge

? What will the charge of each sphere be after the spheres are touched together and removed?



Conservation of Charge

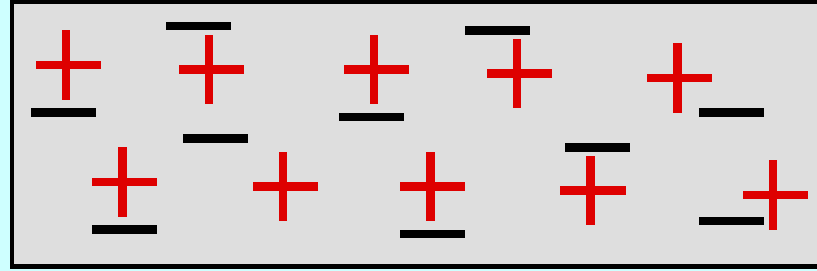
- Total Charge is conserved
- Total Charge is distributed evenly



Laws of attraction

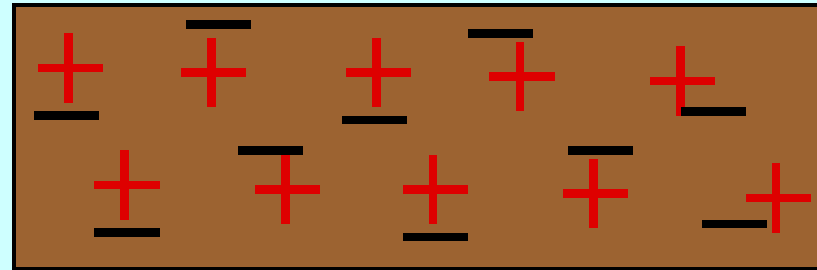
1. Opposite Charges Attract
2. Like Charges Repel
3. Charge objects *always* attract neutral objects





Conductor

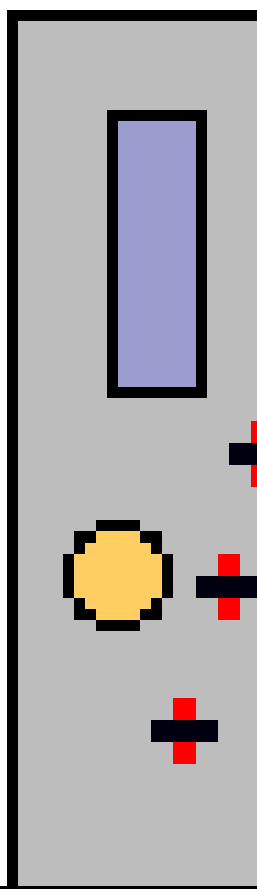
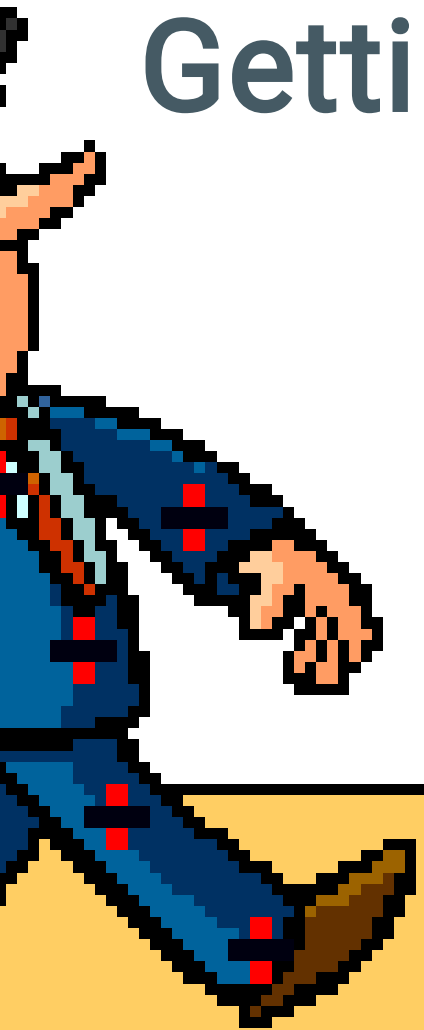
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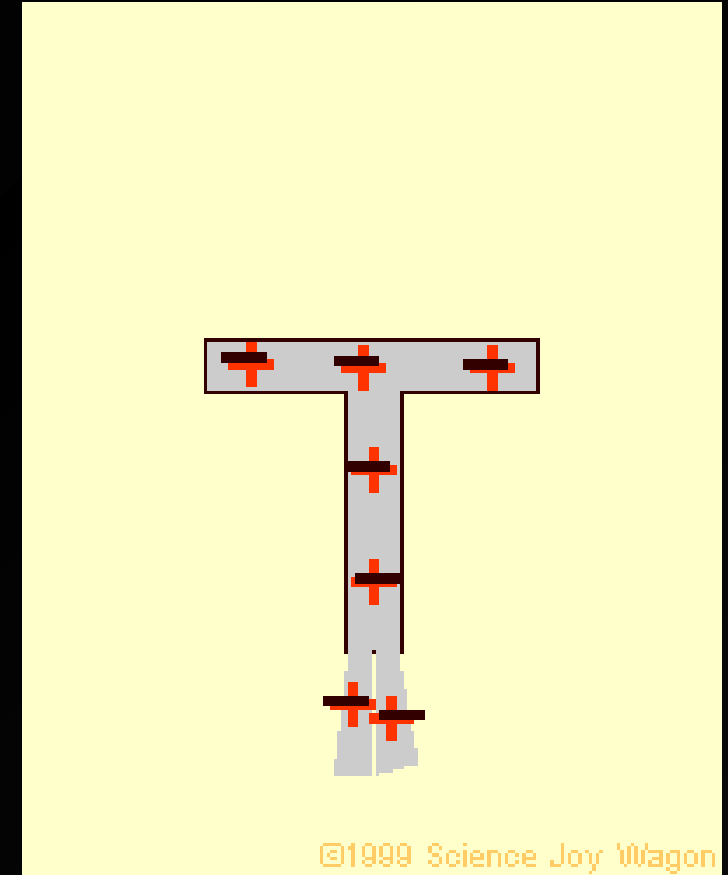
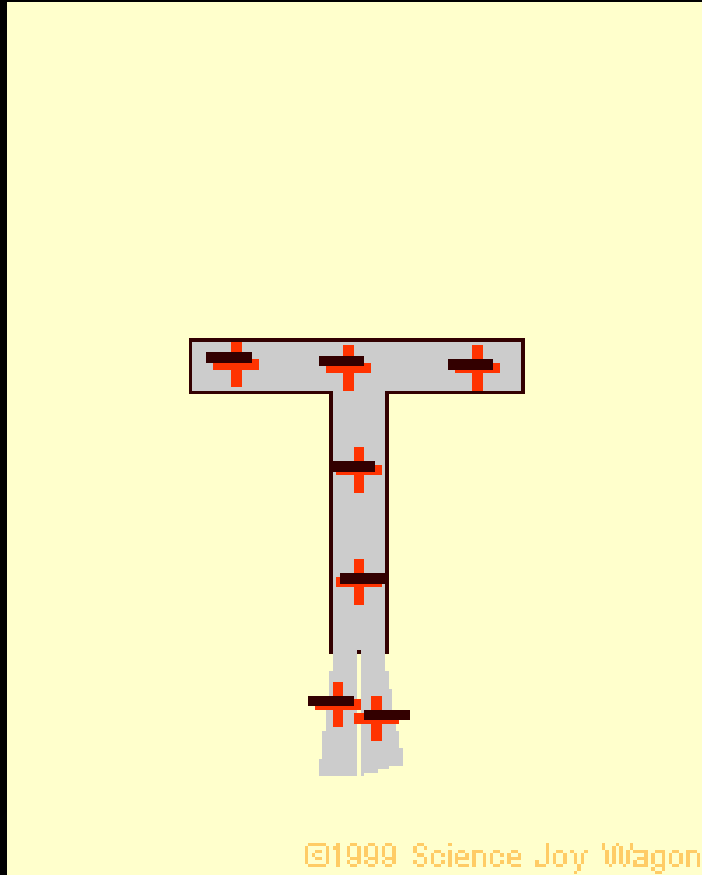
Insulator

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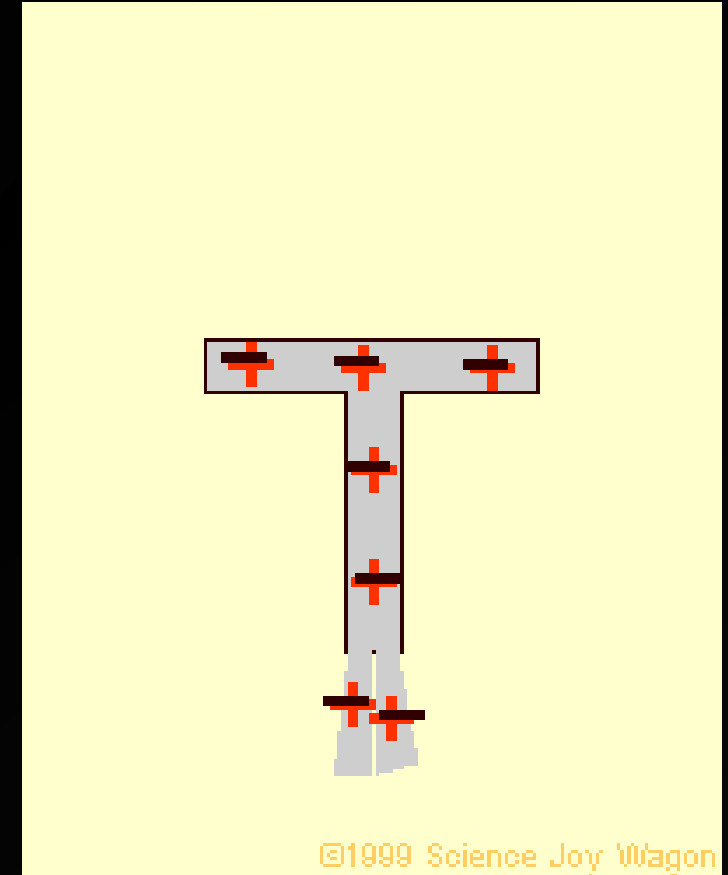
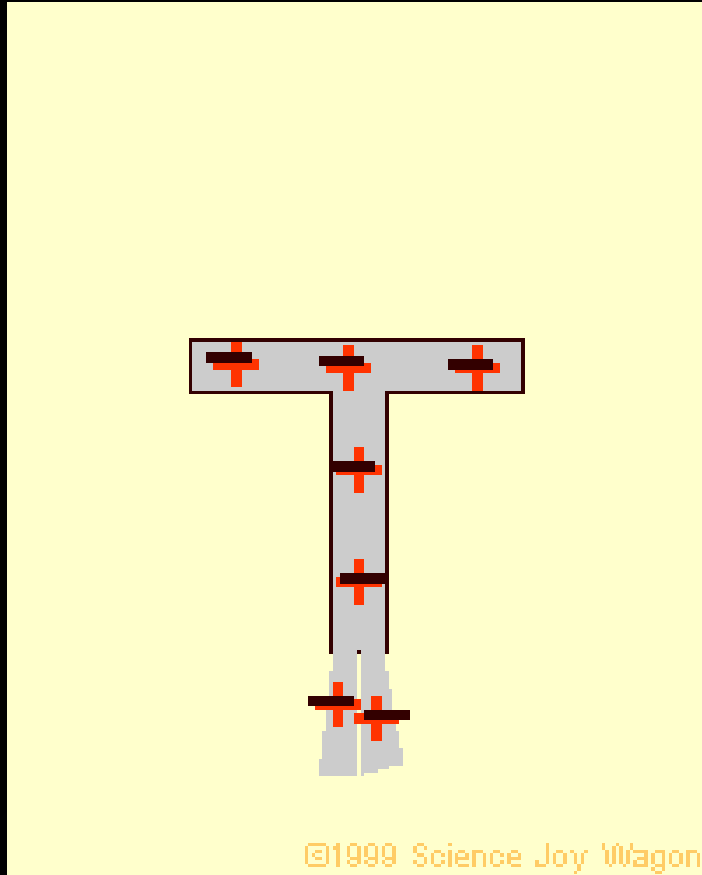
Getting Charged



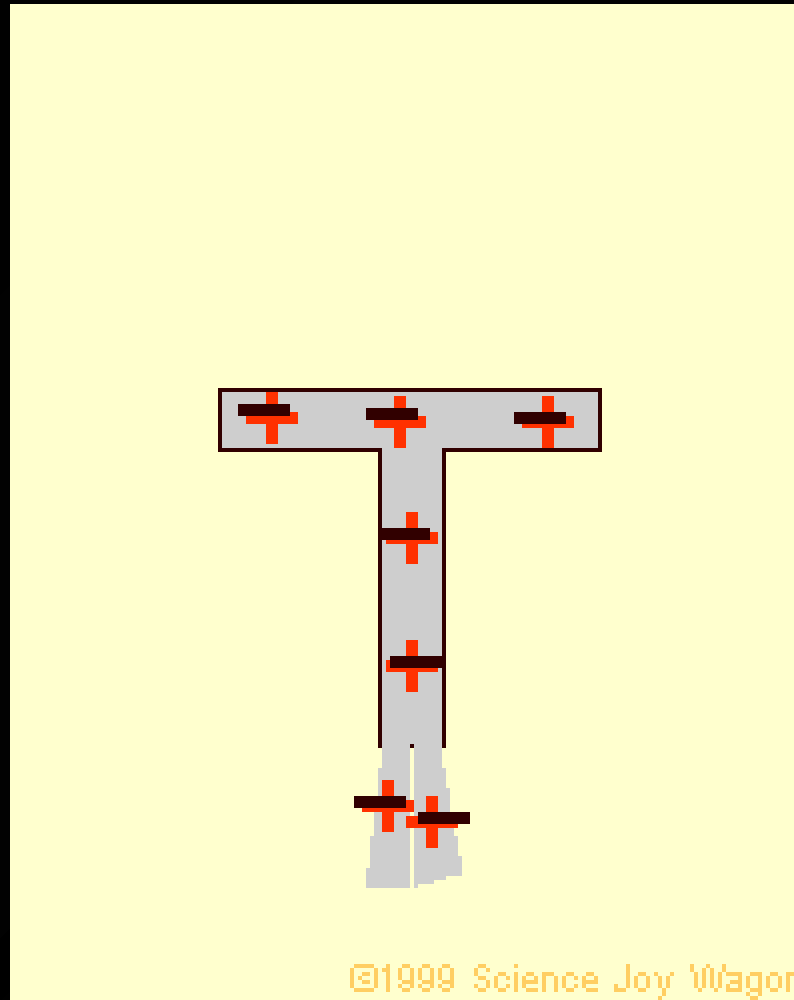
Electroscope



Electroscope Contact Conduction



Induction



Coulomb's Law